

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
22 April 2004 (22.04.2004)

PCT

(10) International Publication Number
WO 2004/033868 A3

(51) International Patent Classification⁷: **F01L 9/04**,
F16K 11/04, 31/08

Ann Arbor, MI 48108 (US). MORRISON, Kevin; 3744
Plaza Drive, Ann Arbor, MI 48108 (US).

(21) International Application Number:
PCT/US2003/031195

(74) Agents: GLENN, Michael, A. et al.; Glenn Patent Group,
3475 Edison Way, Suite L., Menlo Park, CA 94025 (US).

(22) International Filing Date: 1 October 2003 (01.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/417,264 9 October 2002 (09.10.2002) US
60/490,195 25 July 2003 (25.07.2003) US
10/674,743 29 September 2003 (29.09.2003) US

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,
SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, UZ, VC, VN, YU, ZA, ZM, ZW.

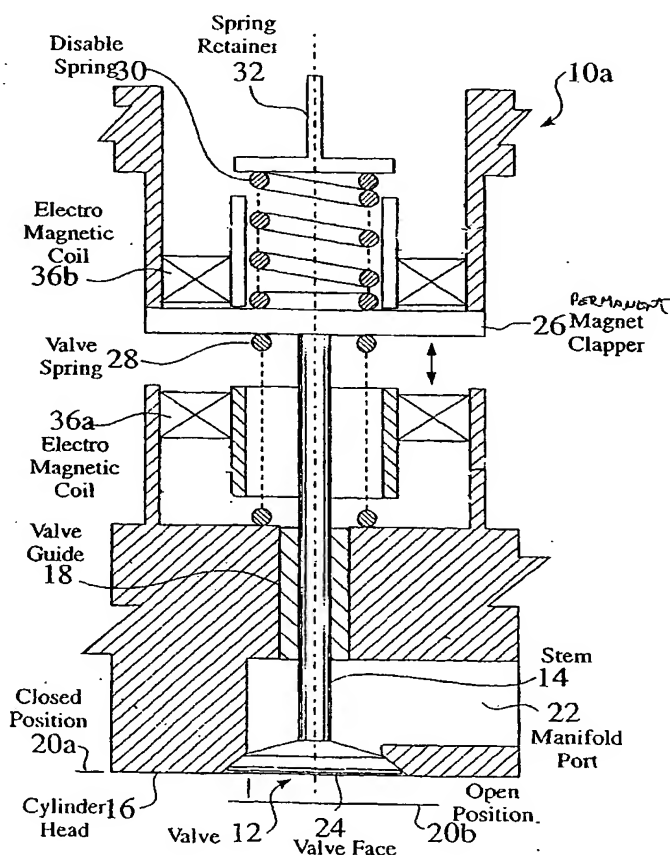
(71) Applicant: SOCIAL PROFIT NETWORK [—/US]; 78
Paul Drive, San Rafael, CA 94903 (US).

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,

(72) Inventors: MOYER, David; 5 Weatherby Road, Hanover,
NH 03755 (US). SCHWARTZ, George; 3744 Plaza Drive,

[Continued on next page]

(54) Title: ELECTROMAGNETIC VALVE SYSTEM



(57) Abstract: Systems (10) are provided for electromag-
netic actuation of a valve mechanism. A valve (12) is lin-
early moveable between a first closed position (20a) and
a second open position (20b). A first spring (28) is com-
pressed when the valve is in the first closed position, and
a second valve spring (30) is compressed when the valve
is in the second open position. An electromagnetic actua-
tion assembly (36a, 36b) and a permanent magnet (26)
is combined with the valve, such that the valve is latch-
able in either a closed or open position, and is readily mov-
able between positions through application of energy to the
electromagnetic circuitry. The electromagnetic circuitry
is controllable to increase or decrease the local magnetic
flux, such as to promote movement of the valve, or to pro-
vide a soft landing of the valve at either end of movement.
Some system embodiments provide energy recovery, feed
back, and/or feed forward sensing and control.

WO 2004/033868 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/31195

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F01L 9/04; F16K 11/04, 31/08

US CL : 251/65, 129.15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 251/65, 129.01-129.22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
East- electromagnetic, permanent, spring, first and second (spring), solenoid

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,647,311 A (Liang et al) 15 July 1997 (07.15.1997), fig. 4, whole document	23-26,28-33,35,37-39
Y		34, 36,40-41
Y	US 5,199,392 A (Kreuter et al) 06 April 1993 (06.04.1993), whole document	34, 36, 40-41
Y	US 5,494,219 A (Maley et al) 27 February 1996 (27.02.1996), whole document	34
A	US 5,769,043 A (Nitkiewicz) 23 June 1998 (23.06.1998), whole document	1
X	US 5,692,463 A (Liang et al) 02 December 1997 (02.12.1997), fig. 1-3, whole document	23-26,28-33,35-37
Y		34,36,40-41
A	US 5,074,259 A (Pusic) 24 December 1991 (24. 12.1991), whole document	1
A	US 6,199,587 B1 (Shlomi et al) 13 March 2001 (12 .03.2001), whole document	1

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

22 March 2004 (22.03.2004)

Date of mailing of the international search report

Authorized officer

Paul J. Hirsch

Telephone No. 703 308-0858

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

Facsimile No. (703)305-3230